

MEMORANDUM FOR: Distribution

FROM: W/OPS2 - /s/ Douglas F. Hess, dated 8/5/04

SUBJECT: AWIPS X-Terminal Replacement Operational Acceptance Test Plan,
August 2004

The attached plan describes how the National Weather Service (NWS) will conduct an Operational Acceptance Test (OAT) of the Advanced Weather Interactive Processing System (AWIPS) X-Terminal Replacement. The X-Terminal Replacements will replace all legacy Hewlett-Packard (HP) X-Terminals with Linux based Personal Computers (PC) at the site AWIPS. The plan describes the equipment, OAT sites, personnel and resource requirements, methodology, schedule, and reporting. The X-Terminal Replacement completes the Linux Workstation replacement project completed last year as part of the on-going upgrade of AWIPS to Linux based systems. The overall Linux migration project for AWIPS is intended to improve AWIPS performance during severe weather and to address AWIPS life cycle support.

There are thirteen participating sites located in all five of the six NWS regions including eight Weather Forecast Offices (WFOs), two River Forecast Centers (RFCs), and three Regional Headquarters during a 6-week period, from mid-August to October 2004.

Mary Buckingham, W/OPS24, is the OAT director. Questions or comments should be directed to Mary by e-mail at Mary.Buckingham@noaa.gov, facsimile 301-713-0912, or telephone 301-713-0326 x137.

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AWIPS X-Terminal (XT) Replacement

Operational Acceptance Test Plan

August 2004

**U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service/Office of Operational Systems
Field Systems Operations Center/Test and Evaluation Branch**



Executive Summary

This plan defines the method the National Weather Service (NWS) will use to conduct an Operational Acceptance Test (OAT) of the Advanced Weather Interactive Processing System (AWIPS) X-terminal (XT) replacement. The XT replacements are new Linux PCs added to AWIPS to replace the existing legacy Hewlett Packard (HP) XTs. This plan describes the equipment, OAT sites, personnel and resource requirements, methodology, schedule, and reporting required for the XT replacement deployment.

The purpose for this OAT is to verify the installation process, operational performance, maintenance impact, and reliability of the new XTs are adequate for deployment to all NWS AWIPS sites. The OAT will provide NWS management with data on the performance of the new AWIPS XTs in routine operational use at 13 offices including eight Weather Forecast Offices (WFOs), two River Forecast Centers (RFCs), and three Regional Headquarters during a 45-day period, from mid-August through late September 2004. The OAT site personnel will install and configure the XTs.

The AWIPS XTs will be used in normal operations for the duration of the OAT. Operators or technicians will note problems in logs and contact the AWIPS Network Control Facility (NCF) for problem resolution. The AWIPS XT hardware will be covered by vendor-supplied maintenance with the vendor and a small quantity of spares at the National Logistics Support Center (NLSC). During the OAT, conference calls between the OAT managers and the field sites will provide information on the installation and any problems with the AWIPS XTs.

The NWS Office of Science and Technology (OST) Systems Engineering Center (SEC) manages the program for the AWIPS XT Replacement project. The NWS Office of Operational Systems (OOS) Maintenance Branch will draft the AWIPS System Modification Note and the Test and Evaluation Branch (TEB) will coordinate the AWIPS XT Replacement OAT and document the OAT results in a AWIPS XT Replacement OAT Report provided to NWS management.

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Acronyms

AJK	WFO Juneau, AK
ARH	Alaska Region Headquarters, Anchorage, AK
AS	Application Server
AWIPS	Advanced Weather Interactive Processing System
AX	WFO or RFC Archive Server
BCQ	Central Region Headquarters, Kansas City, MO (AWIPS site identifier)
BOI	WFO Boise, ID
BOX	WFO Boston, MA
BUF	WFO Buffalo, NY
CD-RW	Compact Disk Read-Write
CLS	Consolidated Logistics System
CP	Communication Processor
CPU	Central Processor Unit
CRH	Central Region Headquarters, Kansas City, MO
DS	Data Server
EHB-13	Engineering Handbook 13
EHB-4	Engineering Handbook No. 4
EHU	Southern Region Headquarters, Ft Worth, TX (AWIPS site identifier)
EMRS	Engineering Management Reporting System
ERH	Eastern Region Headquarters, Bohemia, NY
ESA	Engineering Systems Analyst
FMK	Field Modification Kits
FSOC	Field Systems Operations Center
GB	Gigabyte
GFE	Graphical Forecast Editor
GHz	Gigahertz
GSA	General Services Administration
HIC	Hydrologist-in-Charge
HP	Hewlett Packard
HP-UX	Hewlett Packard Unix
HSL	high speed LAN

IBM	International Business Machines
ICT	WFO Wichita, KS
IT/OP	Information Technology/ Operations
IP	Internet Protocol
IX	Informix Server
KHz	Kilohertz
KM	Kilometer
KRF	Missouri Basin River Forecast Center, Pleasant Hill, MO
LAN	Local Area Network
LCD	Liquid Crystal Display
LDAD	Local Data Acquisition and Dissemination
IFPS	Interactive Forecast Preparation System
LRU	Lowest Replaceable Unit
LUB	WFO Lubbock, TX
LX	Linux Workstation
Mbps	Megabits per Second
MHz	Megahertz
MIC	Meteorologist-in-Charge
NCEP	National Center for Environmental Prediction
NCF	Network Control Facility
NGIT	Northrop Grumman Information Technology, Inc.
NLSC	National Logistics Support Center
NRC	National Reconditioning Center
NWS	National Weather Service
OAT	Operational Acceptance Test
OB4	Operational Build 4
OHX	WFO Nashville, TN
OOS	Office of Operational Systems
ORDA	Open Radar Data Acquisition
OS	Operating System
OST	Office of Science and Technology
PC	Personal Computer
POC	Point of Contact

PRH	Pacific Region Headquarters, Honolulu, HI
PX	Linux Pre-processors
RAID	Redundant Array of Inexpensive Disks
REP	River Ensemble Processor
REV	WFO Reno, NV
RFC	River Forecast Center
SBN	Satellite Broadcast Network
SEC	Systems Engineering Center
SID	Site Identification
SRH	Southern Region Headquarters, Ft Worth, TX
SST	Site Support Team
TAR	Northeast River Forecast Center, Taunton, MA
TRG	Test Review Group
VRH	Alaska Region Headquarters, Anchorage, AK (AWIPS site identifier)
WFO	Weather Forecast Offices
WPR	Workstation Performance Rating
WSH	NWS Headquarters
XT	X-Terminal

PART I: OAT Overview

1.0 Introduction

This plan describes the method the National Weather Service (NWS) will use to conduct an Operational Acceptance Test (OAT) of the Advanced Weather Interactive Processing System (AWIPS) XT replacement migration. The plan presents the OAT objectives, methodology, management, material resources, and schedule. The roles and responsibilities of NWS personnel in selecting OAT sites, configuring them, and operating the AWIPS XTs are also identified. The OAT will validate the operational use of the AWIPS XTs at eight Weather Forecast Offices (WFOs), two River Forecast Centers (RFC), and three Regional Headquarters (see Part II, Section 2.0, OAT Sites).

Performance problems and throughput ceilings were identified as important limiting factors as operational data volumes have increased in AWIPS. To address these problems, the NWS is implementing open source Linux technology and high performance Personal Computer (PC) hardware. Phase I of the migration of AWIPS hardware to Linux PC-based equipment (see Section 4) was completed in the first half of 2003 with the deployment of the Linux Pre-processors (PX). Phase II of the Linux migration project commences with the full Linux replacement of the aging HP hardware. The first part of phase II is the full replacement of the HP workstations. This OAT will evaluate Phase II, Step 1 of the *AWIPS Linux Migration Plan* and ensure the system is ready for national deployment.

2.0 Purpose

The OAT for the AWIPS XT Replacement will provide NWS management with information about the installation process, the operational and maintenance impact, performance, and reliability of the new hardware and software at a representative sample of NWS offices over a 45-day period. The OAT will aid in improving the installation process to reduce the adverse impact on field operations.

3.0 OAT Objectives

The OAT objectives are:

- a. Verify the XT Replacement AWIPS System Modification Note(s) allow site personnel to install the new AWIPS XTs, connect them to AWIPS, and reconfigure the systems with a minimum of disruption to the site data flow and operations.
- b. Verify the AWIPS XTs and reconfigured systems operate reliably during site operations in a 45-day demonstration at 13 sites.
- c. Verify the Network Control Facility (NCF) can monitor the AWIPS XTs.

4.0 Background

The existing AWIPS Hewlett-Packard (HP) XTs are now over seven years old and are not fully compatible with the new Linux workstations. As operational data volumes have increased, performance problems and throughput ceilings were identified as important limiting factors in the old HP based system. To address these problems, the NWS investigated the use of open source Linux technology and high performance PC hardware and found it provided significant performance improvements and maintenance cost savings.

4.1 Phase I Linux PC Migration

Phase I of the AWIPS Linux PC migration is now complete with the installation of the Linux Pre-processors (PX) during the first half of calendar year 2003. Phase I included the Linux workstation augmentation during 2001, the hosting of the AWIPS Communication Processor (CP) software on a Linux PC platform and the addition of the high speed LAN (HSL) to replace the 10 megabits per second (Mbps) local area network (LAN) segment in the site architecture in 2002. The final step of Phase I was the Linux PX project begun in the summer 2002. The PX step inserted a pair of data servers and eight 36-gigabyte (GB) disks in a shared Redundant Array of Inexpensive Disks (RAID) (i.e., shared disk array) to handle the product decoding function performed on the Data Server (DS) and Application Server (AS). The added disk storage and new processors removed a significant amount of the DS Satellite Broadcast Network (SBN) ingest and decoding load, and made preparations for significant local product distribution changes planned for future Linux upgrades.

4.2 Phase II Linux PC Migration

Because the Phase I Linux migration resulted in decreased maintenance costs and greatly increased processing speed, the NWS decided to continue to Phase II of the Linux migration. The addition of the Graphical Forecast Editor (GFE) software significantly increased system processing needs. The NWS continues to increase demands on the AWIPS system performance with the addition of the Interactive Forecast Preparation System (IFPS) and GFE to operations, increased data resolution and quantity.

Table 1. AWIPS Workstation Performance Rating (WPR) Actual/Projection			
FY	WPR without Phase II Linux (sec.)	WPR Goal to meet GPRA (sec.)	Operational Program Enhancements
01	247	200	Original HP System
02	~120	200	Phase I Linux Begun
03	108	190	Phase I Linux Complete
04	149	185	IFPS/GFE at 2.5Km
05	205	180	ORDA TDWR ARSR
06	300	175	WRF-8
07	390	170	
08	530	165	Dual Pol
09	730	160	NPOES
10	1000	140	

Since the success of Phase I demonstrated improved system performance and lower maintenance costs and the NWS will have an increasing need for more power in the AWIPS to meet agency goals, the Linux migration Phase II continues to replace aging HP workstation servers with new faster Linux PC servers. Table 1 shows the planned improvements for AWIPS and their projected effect on system performance if no further Linux upgrades had been made. The Service Assessment for the November 9-11, 2002 Tornado Outbreak produced two key recommendations to address NWS services. The first recommendation was to replace the older HP workstations with newer high performance Linux workstations. This will:

- Allow forecasters to use new radar data sets to diagnose storm structure to make decisions about warning for severe weather and tornadoes
- Lower loop loading delays
- Reduce contention between the use of the two existing Linux workstations for IFPS and warning operations.

The Second key recommendation was to enhance the AWIPS Decision Assistance software tools. Decision Assistance software tools are currently turned off at some sites during severe weather due to insufficient Central Processor Unit (CPU), memory, and Disk I/O resources of the old HP servers. Continued upgrading to Linux servers to replace the aging HP servers will address these critical NWS needs. In addition, the NWS intends to put the Linux equipment on a three-year upgrade or refreshment cycle to ensure the servers are current and maintainable, assuming sufficient funding is available.

Phase II intends to replace all the workstations with Linux PCs (completed), upgrade the SBN (currently underway), replace the Data Server (DS) with an Informix Server (IX) for the Informix database, replace the routers, replace the Local Data Acquisition and Dissemination (LDAD) server, replace the Application Server (AS), and replace the LDAD Firewall over the next seven years. In addition, an effort will concurrently be made to improve the system performance with a software re-architecture effort. The Linux workstation replacement was completed in 2004. This plan specifically addresses the XT replacement scheduled for FY05.

4.3 XT Replacement Description and Configuration

Each new XT will be configured with a 19-inch Liquid Crystal Display (LCD) screen controlled by a Linux PC and a single mouse and keyboard.

The components for the XTs are:

Hardware:

Full XT Replacement:

Dell Precision 360n Minitower Linux workstation incorporating the following features:

- 2.8 Ghz Intel Xeon processor with 1MB L2 cache
- 533 Mhz Front Side Bus.
- 512MB of memory, DDR333 SDRAM, non-ECC (2x256)
- Nvidia graphics card, Quadro NVS 280, 64MB, dual VGA (dual monitor capable)
- 40GB hard drive, IDE/ATA-100, 7200 RPM
- 3.5-inch floppy
- 48x CD-ROM drive

- Integrated AC'97 Full-Duplex Audio
- Two external stereo speakers with power amplifier and volume control
- One 19-inch LCD monitor, Dell Ultrasharp 1901FP Flat Panel
 - ◆ *Display Type:* Flat Panel display/TFT Active Matrix
 - ◆ *Diagonal Size/Viewable Size:* 19-inch viewable/19-inch diagonal
 - ◆ *Features:* Antiglare with hard-coating
 - ◆ *Dot Pitch:* .30mm dot pitch (or less)
 - ◆ *Image Brightness:* 220CD/m2
 - ◆ *Image Type:* non-interlaced
 - ◆ *Maximum Resolution:* 1280x1024@75Hz
 - ◆ *Maximum Synch Rate:* (VxH): 76Hz x 80KHz
- Three-button Point II mouse
- Mini-tower chassis

Software:

- Red Hat Linux operating system (OS) Version 7.2 (custom version supplied by the NWS.
- System Restore CD
- AWIPS OB4 Software Build

Installation Kits:

The Northrop Grumman Information Technology, Inc. (NGIT) will prepare the Field Modification Kits (FMK) for the sites to install and configure the XTs. The PC components will be drop shipped to the sites from the manufacturer separately from the FMK with no operating system installed. The FMK will include the system restore CD and the installation software will include the operating system. The new XT will be ready to run once the installation scripts and localization are run. However, sites will be responsible for loading and configuring their local application software running on the old XTs to the new XTs.

Service:

For the life of the XTs, all the spare systems will be stocked by the National Logistics Support Center (NLSC). NLSC will ship replacements to the sites. When the replacement

XT System Design Diagram

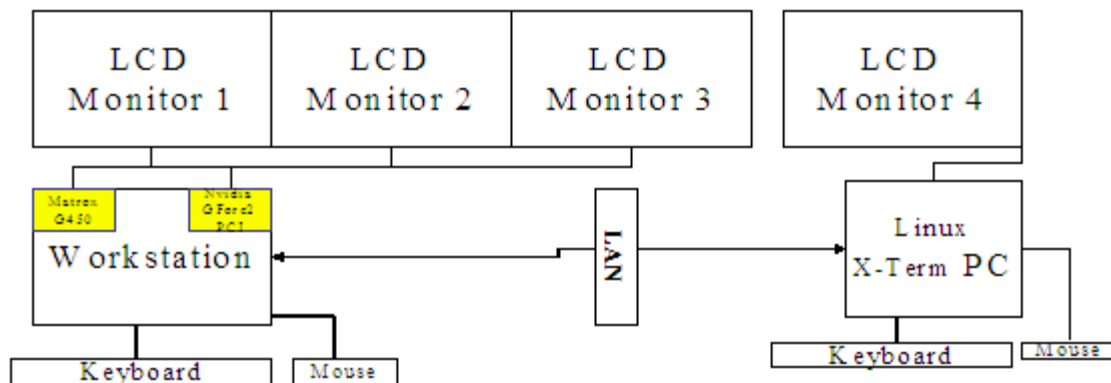


Figure 1. XT Replacement Architecture

arrives, the site will ship the defective unit to NLSC who will arrange for service from the vendor. The OCONUS sites will have NLSC support with shipment by Federal Express. Shipments to Anchorage and Hawaii arrive the next day. Shipments to Guam arrive by noon on the 2nd day. The vendor will support the XT hardware with a service agreement providing next day response 5 days/week, 10 hours/day parts and labor, and on-site hardware maintenance to NRC for 3 years. The initial delivery will be supported by NGIT until the spares are added to NLSC. See Section 5.6, System Support, for details.

5.0 OAT Policies

The following conditions will be adhered to in the oversight of the OAT.

5.1 OAT Assumptions and Limitations

- a. The AWIPS XTs must successfully complete the development installation and stability tests with no outstanding critical problems.
- b. NGIT will integrate the XTs and will be responsible for the installation and AWIPS baseline software. The XTs Field Modification Kits (FMKs) will be shipped from NGIT

in one box (sites with a large number of XTs may receive two boxes). The hardware vendor will ship the XT hardware in two boxes for each workstation (one box for each Dell Precision 360n Linux PC and one box containing the monitors). The FMK and XT hardware shipments will likely not coincide.

- c. The AWIPS System Modification Note 22 (installation and configuration instructions) updates will be made available on an Internet page.
- d. The OAT site personnel will install the system, load the software changes including the OS from CDs, configure, and localize the new XTs.
- e. The AWIPS XT hardware is covered by a 3-year maintenance agreement with Dell, Inc.. A few spares will be maintained by the NLSC to support failures in the field. After first contacting the NCF, site personnel will get a spare from NLSC and the NRC will work directly with Dell to troubleshoot and repair the hardware. For shipping damage and infant failure, sites should contact the vendor POC (see Section 5.6) for resolution.
- f. The NCF will provide 24-hour a day, 7 days a week support for the AWIPS XTs and will track problems with trouble tickets.
- g. The OAT sites will have AWIPS Release Operational Build 4 (OB4) and the available maintenance patches installed prior to installing the XTs.

5.2 OAT Commencement and Prerequisites

The OAT will begin after the OAT director (see Section 6.0) verifies the following prerequisites are met:

- a. OAT Plan is completed and signed by the Office of Operational Systems (OOS), Director, Field Systems Operations Center (FSOC) in coordination with the OOS Maintenance, Logistics and Acquisition Division, the Office of Science and Technology (OST) AWIPS XT Replacement Project Manager, and the AWIPS Regional focal points.
- b. The AWIPS XT equipment must be successfully installed and configured on a NWS Headquarters (WSH) test system(s) and it must be operated for at least 72 hours with no critical problems unresolved.
- c. The following must be received at each site:
 - 1. 2 boxes shipped from the XT vendor (1 Dell Precision 360n Linux PC, 1 LCD monitor) for each HP XT on site.
 - 2. The Field Modification Kit sent from NGIT containing the necessary cables and installation CD.
 - 3. AWIPS System Modification Note 22 (installation and configuration instructions [also available on line <ftp://140.90.24.7/AWIPS>]).
- d. The OAT sites must not install the PCs, cables, or software until the WSH OAT director has informed the site it may begin. Sites should inspect the shipments and may boot the

new computers to determine whether there is infant failure or shipping damage. See Section 5.6 for the contact for shipping damage and infant failure resolution.

5.3 Site Installation

At all OAT sites, the new AWIPS XT equipment installations are performed by the NWS site personnel using the AWIPS System Modification Note. The OAT site personnel will install the new AWIPS XTs, and cables, configure the systems, and make the required connections. The installation also includes removal and disposal of the old HP XTs. The operations of the site are not affected until the old XTs are disconnected from the LAN and the new ones connected. The hardware installation is estimated to take a maximum of 2 hours to lay all the cables and backup LX1 to restore to the new XTs. In addition, each XT installation is estimated to take about 1.5-2.0 hours to install the baseline software and configuration (15-30 minutes for hardware setup, 20-30 minutes for software load and configuration, 15-30 minutes to remove old XTs and relocate the LX, 30-45 minutes to activate the LX, 15-30 minutes for LX checkout). Installation assistance, if required, will be provided by telephone from the NCF at 301-713-9344.

5.4 OAT Conduct and Duration

The OAT will follow the AWIPS XT Replacement OAT Plan, Part II, Section 3.0, OAT Methodology and Section 5.0, OAT Schedule. The OAT will validate the installation, system support strategy, and operations during a 45-day period.

The OAT site WFO Meteorologist-in-Charge (MICs) or RFC Hydrologist-in-Charge (HICs) has the authority to suspend the OAT at their site if, at any time, the site service operations are negatively affected. They will notify the OAT director of this decision and why it was made as soon as practical.

OAT site personnel will log AWIPS XT problems and notify the NCF as soon as possible. They will also notify the OAT director of problems by e-mail as soon as practical. Any problem deemed critical during the OAT will be a reason to suspend the OAT. After the installation, the sites should see no degradation in the performance of their system.

5.5 System Operation

The AWIPS XTs will be operated 24 hours a day, 7 days a week during the OAT.

5.6 System Support

The operational support and maintenance concept for the Linux hardware components will differ in some important ways from their existing Hewlett Packard Unix (HP-UX) counterparts. If maintenance is required, site personnel must contact the AWIPS NCF. AWIPS problem resolution and maintenance are centralized at the NCF. The NCF will have monitor and control responsibility for the AWIPS XTs. Information Technology/ Operations (IT/OPs) monitoring agents will be moved to the new XTs to enable automatic NCF detection of problems. When a fault or problem is discovered by NCF personnel or is phoned into the NCF Help Desk, the problem will be diagnosed by the NCF operators and resolution coordinated with the NWS site representative, if necessary. Often, the NCF can discover problems and correct them without

requiring coordination with the site. The NCF will generate a trouble ticket to document and track each problem.

The XT hardware components are covered by a maintenance contract with the vendor, NGIT through Dell, Inc. The NLSC will stock adequate numbers of spare systems to quickly resolve any hardware problems encountered. **All problems with the XTs must be called into the NCF for tracking of the trouble and resolution of the problems.** If the problem is found to be software related, the problem will be forwarded to the appropriate personnel for resolution. If the problem is hardware related, the site will order a replacement XT or lowest replaceable unit (LRU) through the Consolidated Logistics System (CLS), and install the new XT or part once it arrives. The site will pack up the defective XT or part and ship it to the National Reconditioning Center (NRC) for repair. All hardware troubleshooting will take place at the NRC. The NRC will also coordinate with Dell to come to its site and repair the XT. The site will enter the appropriate data into the Engineering Management Reporting System (EMRS) system. (Contact John Merhi for all maintenance data reporting requirements for EMRS at 301-713-1892 x200.)

The initial delivery includes 90 days to resolve shipping and infant failure problems from the time the system is shipped from the vendor. Failure to boot constitutes infant failure. Sites should inspect the XTs upon receipt and determine whether they will boot up. For shipping and initial failure problems, **contact the NCF**. Disposal of the old HP XTs will be the same procedure as was used to dispose of the HP workstations (see AWIPS Information Note: [http://www.ops1.nws.noaa.gov/awipsnew/software/InfoNote17RevA\(HP-disposal\)_S.pdf](http://www.ops1.nws.noaa.gov/awipsnew/software/InfoNote17RevA(HP-disposal)_S.pdf)).

6.0 OAT Management

These sections describe the roles and responsibilities of the NWS in the oversight and management of the OAT. The NWS OOS FSOC TEB has overall responsibility for coordinating the AWIPS XT Replacement OAT. The OST Systems Engineering Center (SEC) has overall project management responsibility for the AWIPS XT Replacement project.

6.1 Test Review Group

The Test Review Group (TRG) is comprised of a group of subject-matter experts and is chaired by the director of the OAT. The role of the TRG is to evaluate the impact of each trouble report on daily field service operations and make recommendations to the AWIPS XT Replacement project manager on their criticality. The TRG is comprised of the personnel from the offices identified in Table 2. Following completion of the OAT, the TRG will convene to review the findings and recommend whether to proceed with national implementation.

Table 2. OAT Test Review Group (TRG)			
Name/Organization		Function	Phone
Mary Buckingham	OPS24	Test Review Group Chair [Voting Member]	301-713-0326 x137
Ken Bashford	OPS24	OAT Coordinator	301-713-0326 x113
Tim Hopkins	OST31	Project Manager [Voting Member]	301-713-1570 x129

Table 2. OAT Test Review Group (TRG)			
Name/Organization		Function	Phone
Joel Williams	OST23	Implementation Manager [Voting Member]	301-713-3400 x114
Brad Scalio	AWIPS NCF	NCF Focal Point	301-713-9344
Jagdish Sharma	OPS12	Maintenance Assurance	301-713-1833 x163
Karthik Srinivasan	OPS12	Maintenance Branch AWIPS Engineer	301-713-1892 x158
Bill Gery	CR41x2	CRH AWIPS Program Manager [Voting Member]	816-891-7734 x414
Ross Dickman	ERx2	ERH AWIPS Program Manager [Voting Member]	631-244-0104
Eric Howieson	SR41x2	SRH AWIPS Program Manager [Voting Member]	817-978-7777 x132
Jeff Walker	WR41	WRH AWIPS Program Manager [Voting Member]	801-524-5120 x 278
Philip Mieczynski	AR41x3	ARH AWIPS Program Manager [Voting Member]	907-271-4421
Alan Samori	PR11	PRH AWIPS Program Manager [Voting Member]	808-532-6430

Validated deficiencies will be categorized as follows:

- a. **Critical Deficiency** - A repeatable problem severely impacts site operations; no acceptable workaround exists.

ACTION: The TRG recommends suspension of the test to the Project Manager. If suspended, the test resumes when the Project Manager approves a proposed corrective action. When an approved corrective action is implemented, regression testing may be required.

- b. **Urgent Deficiency** - A repeatable problem severely impacts site operations; however, an acceptable workaround exists.

ACTION: The test continues with the current system using a workaround until a permanent fix is available. Once the Project Manager approves the fix, only those test areas affected by the problem will be retested.

- c. **Routine Deficiency** - A repeatable minor problem does not significantly impact site operations.

ACTION: The test continues with the current system; approved workarounds may be implemented. Routine deficiencies are submitted by the TRG to the Project Manager for adjudication.

- d. **Watch Item** - A random or one-time, non-repeatable problem with potentially significant impact on site operations.

ACTION: The TRG monitors test activities for recurrence of the problem; if recurrence is documented, the TRG considers re-categorizing the problem.

- e. **Potential Enhancement** - Identifies a new requirement.

ACTION: The TRG forwards the potential enhancement to the Project Manager for adjudication. The Project Manager may then forward the potential enhancement as a Request for Change.

6.2 National Weather Service Headquarters

OAT Director - (OOS TEB, Mary Buckingham, 301-713-0326 x137) Organizes and manages the NWS personnel supporting the OAT. Documents and coordinates for signature the NWS involvement in the OAT in a formal OAT Plan. Coordinates conference calls and manages the day-to-day OAT data collection, collecting the data, and creating the required reports. Documents the results in the OAT Report and provides briefings as required. Participates as an on-site test team member and chairs the TRG.

OAT Coordinator - (OOS TEB, Ken Bashford, 301-713-0326 x113) Assists in organizing and managing the NWS personnel supporting the OAT. Documents and coordinates for signature the NWS involvement in the OAT in a formal OAT Plan. Coordinates conference calls and manages the day-to-day OAT data collection, collecting the data, and creating the required reports. Documents the results in the OAT Report and provides briefings as required. Participates as an on-site test team member

AWIPS XT Replacement Project Manager - (OST SEC, Tim Hopkins, 301-713-1570 x129) Reviews the AWIPS XT Replacement OAT Plan and Report. Participates in the OAT as a AWIPS XT technical resource. The OST SEC has overall engineering responsibility for the XT Replacement project. This includes the development of the target hardware architecture for the new XTs, by the Architecture and Analysis Branch and any required changes to the AWIPS software by the SEC Development Branch. The SEC Development Branch will also integrate and test the software loads for the XTs and produce any CDs required for Linux-based deployment. The SEC Development Branch will also have overall responsibility to manage software development activities required for these deployments. Voting member of the TRG.

AWIPS XT Replacement Implementation Manager - (OST, Joel Williams, 301-713-3400 x114) Reviews the AWIPS XT Replacement OAT Plan and Report. Participates in the OAT as a AWIPS XT technical resource. Has overall responsibility for implementing the XT replacements. Voting member of the TRG.

Maintenance Branch AWIPS Computer Specialist - (OOS, Maintenance Branch, Jagdish Sharma, 301-713-1833 x128) Responsible for the AWIPS System Modification Note and coordinates maintenance issues. Supports the OAT in all maintenance related activities. Focal point for the modification and maintenance note coordination, documentation publications, and logistics and maintenance. Reviews the AWIPS XT Replacement OAT Plan and Report.

Maintenance Branch AWIPS Engineering Support - (OOS, Maintenance Branch, Karthik Srinivasan, 301-713-1892 x158) Provides support for the modification and maintenance note coordination, documentation publications, and logistics and maintenance focal point.

OAT Team Members - Supports the OAT director in coordinating and managing the OAT activities. Contributes to the analysis of the test data and writing and review of plans, reports, and conference call minutes and provides input to the OAT director. The members include personnel from OST, and OOS (see Attachment 4, Table A4-1).

AWIPS XT Replacement Support - (NCF Focal Point: Gary Charles (301) 713-9362) The NCF will provide support to field site users if problems develop. ***Operators must report all AWIPS XT problems to the NCF at 301-713- 9344.*** The Site Support Team (SST) will provide assistance to the OAT sites in resolving software problems with the XTs and may send a representative to witness the first site installed.

6.3 NWS Regional Headquarters/NCEP

The NWS Regional Headquarters will participate in the development and review of the OAT Plan and will monitor developments at their respective sites during the OAT. Specifically, the Regional AWIPS Focal Points or designees will:

- a. Review and coordinate the proposed OAT sites to comment on their availability and suitability.
- b. Coordinate requirements for site preparation, equipment installation, operations and reporting with other members of the OAT site management team.
- c. Identify NWS points of contact for each OAT site.
- d. Participate in OAT conference calls.
- e. The NWS Central Region Headquarters (CRH), Alaska Region Headquarters (ARH), Eastern Region Headquarters (ERH), and Southern Region Headquarters (SRH) will participate as OAT sites. As such, they will designate regional personnel as focal points.

6.4 NWS OAT Sites

The OAT sites will:

- a. Identify an AWIPS XT focal point (see Table A4-2) to coordinate the system installation and complete the Installation Evaluation in Attachment 2.
- b. Ensure AWIPS release OB4 and any available patches are installed prior to beginning the installation of the new XTs. Coordinate any delays with the OAT director and coordinator.
- c. Install and configure the new XTs using the most recent revision of the AWIPS System Modification Note after the OAT director allows the site to begin.

- d. Use the AWIPS XTs in operations during the OAT, documenting problems or difficulties to operations arising from the XT's use.
- e. Participate in conference calls to provide information on the XTs installation and operations.
- f. Document all maintenance activity associated with this Oat Plan by the EMRS Data Entry System. Follow the specific guidance for maintenance activity documentation provided in the AWIPS System Modification Note.

PART II: OAT Methodology

1.0 Introduction and Approach

The AWIPS XT Replacement OAT evaluates the new system installation and operation for 45 days at ten field sites and three regional headquarters. The site personnel will install the hardware and software. The installations will be monitored to allow revision of the AWIPS System Modification Note as needed. At the end of the OAT period, TEB will analyze the test data to develop conclusions about the XT performance. The conclusions, along with information from the NCF, will support the recommendations for the AWIPS XT Replacement full deployment decision.

2.0 OAT Sites

The thirteen test sites were chosen to represent the characteristics of each region, the types of AWIPS sites, and are approximately 10% of all AWIPS sites to form a valid statistical sample. Table 3 lists the sites participating in this OAT and their site identification (SID) code. Each OAT site will designate a Focal Point to communicate with the OAT Team from the WSH and to be responsible for the conduct of the OAT at the site. A complete listing of the sites' addresses, telephone numbers, and focal points are given in Attachment 4, Table A4-2, OAT Site Contacts.

Table 3. OAT Sites		
Region/NCEP	Office	SID
Central	Central Region Headquarters, Kansas City, MO	BCQ
	Missouri Basin RFC	KRF
	WFO Wichita, KS	ICT
Eastern	WFO Buffalo, NY	BUF
	WFO Boston, MA	BOX
	Northeast RFC	TAR
Southern	Southern Region Headquarters, Ft Worth, TX	EHU
	WFO Lubbock, TX	LUB
	WFO Nashville, TN	OHX
Western	WFO Boise, MT	BOI
	WFO Reno, NV	REV
Alaska	Alaska Region Headquarters, Anchorage, AK	VRH
	WFO Juneau, AK	AJK

3.0 OAT Methodology

The XT evaluation will focus primarily on two aspects:

- 1) The installation of the new XTs, and
- 2) The performance of the XTs.

The OAT will also ensure the installation does not affect other aspects of the AWIPS system. Because the new XTs add new hardware and software in the critical AWIPS forecaster interface, the installation must be done smoothly and quickly at each AWIPS site to prevent an adverse impact on site operations. The installation is estimated to take 2 hours per XT averaging 10 hours to complete (assuming an average of five XTs at a site). There should be no loss of data to the sites during the installation but the insertion of new and removal of old XTs will have to be coordinated with the forecasters. Sites are requested to schedule the installation for a day when the disruption can be tolerated. Sites may also choose to install some XTs one day and others another day.

Central Region Headquarters installed an XT in July to test it while they are testing the alpha load for OB4 to facilitate the development testing. The evaluation will begin with a regional headquarter's non-operational site installing the new XTs with the draft AWIPS System Modification Notes for guidance. WSH OAT Team support will be on site to evaluate the Modification Note. All problems with the installation procedures will be corrected before the next site is installed. Sites must have already installed AWIPS Release OB4 and any available patches prior to installing the new XTs. If the Modification Notes are deemed ready, then the first and second operational field test sites will install the new system with a small test team on site for support. Once the NWS has confidence the installation will go smoothly, the other test sites will install their XTs. If substantial difficulties are encountered, another operational site will be installed before the authorization for the remainder of the sites is given. (See Section 5.0 for the tentative detailed schedule)

The OAT will be conducted by the WSH OAT team and the test site personnel with occasional conference calls and required contacts by telephone and electronic mail. The OAT methodology consists of the activities in Section 5, Table 4, OAT Activities and Schedule. A pre-OAT conference call will be held during the week prior to beginning the OAT with the OAT sites, WSH OAT team, and regional focal points. This conference call will ensure the OAT is ready to begin, the sites understand what is expected of them and the team is ready to support the OAT.

3.1 Success Criteria

The success or failure of the OAT will be based on the acceptability of the installation instructions and kits to the OAT site Engineering System Analysts (ESA), and analyses of data collected during the OAT. Deficiencies in the installation will be addressed by revision of the instructions as needed and changes to the FMKs during the deployment of the XTs. The site focal points will judge the acceptability of the software and use of the XTs in the field operations based on input from their site staff. Any critical failures needing software changes will be addressed by patches to the software. The TRG will collect and address any deficiencies reported during the OAT as described in Part 1, Section 6.1.

3.2 OAT Documentation

The documentation required for the OAT includes:

1. Installation Evaluation (See Attachment 2) to be completed by the person(s) who performed the installation and checkout. The site personnel are requested to provide comments about the questions on both their positive and negative experiences. Suggestions for improvement are encouraged. The completed evaluation questionnaire can be faxed to 301-713-0912 or the answers e-mailed to Mary.Buckingham@noaa.gov.
2. Document any problems encountered or impacts on site operations, and improvement suggestions. Site logs or email may be used (fax paper to 301-713-0912; send e-mails to Mary.Buckingham@noaa.gov).
3. EMRS reporting.

3.3 XT Replacement Evaluation Methodology

The XT evaluation will consist of site assessment of the installation and performance of the new XTs in site operations.

3.3.1 System Installation

The OAT sites will receive the XT FMK from NGIT and the XT hardware from the vendor shortly prior to commencement of the OAT (see Part I, Section 5.2, item c). The OAT sites may open the boxes to ensure all expected components arrived and inspect for shipping damage but **must not install the system until the OAT director authorizes them to start.**

To reduce the risk of incorrect installations and excessive impact on site operations, the OAT will control the installations and assess the Modification Note for each type of AWIPS site. After each type of installation, the Modification Note will be revised incorporating the information gained from the previous installation. If necessary, additional Modification Notes will be drafted to address the installation for specific types of systems. The Maintenance Branch will make the decision to draft additional Modification Notes. Sites will use the latest revision of the Modification Note for their installation once the OAT director authorizes their installation. Because the installation affects the forecaster interface, the installation must be carefully evaluated. Each type of site will be installed with the assistance of the test team to ensure the installation instructions are correctly noted in the Modification Note.

The AWIPS XTs will be delivered to the OAT sites with no operating system. The NWS-prepared disk image containing the pre-installed operating systems and device drivers will be included in the FMK. The first site (a regional headquarters) will begin installation when the test team arrives to observe the installation and will follow the AWIPS System Modification Note. The sites will notify the NCF when the installation is beginning, install the XTs and make associated connections, install the provided software from the CD, and configure the new XTs including localization. The NCF should continue normal monitoring of the rest of the system since the installation should not affect the operation of the other components. Each site is

responsible for porting and ensuring all necessary links and mounts are set up for their local applications running on the XTs.

When the installation is complete, the site should notify the NCF to resume normal site monitoring. A conference call with the first site will evaluate the installation and provide an opportunity for the remainder of the test sites to learn what is involved and ask questions. All the OAT sites and Regional Program Managers will be invited to participate in the conference calls. Immediately after successfully completing the installation, the site personnel will complete the Installation Evaluation. The Maintenance Branch will incorporate any corrections to the Modification Note and make the revised Note available to the OAT sites. The second OAT site will install with test team attendance followed by the third site. Once the observed installations are finished and the Modification Note is revised using the information gained from those sites, the remainder of the test sites will be given the authorization to proceed with their installations following the latest revision of the Modification Note.

Information Note No. 17 will include details on the disposal of the old HP XTs.

3.3.2 Test Site Actions

The test sites should keep track of any system crashes or anomalies they might see during the evaluation and report them to the OAT director. The new XTs should not adversely affect other aspects of the AWIPS system. It is expected the forecasters will notice improved performance from the more powerful new XTs. Sites should ensure the hydrology applications and the WWA and Warnen applications work properly with the new XTs.

Complete the Installation Evaluation in Attachment 2 and return it to WSH (Section 3.1, item 1).

If a catastrophic failure occurs, the old HP XTs may be returned to service. The site management will make any decisions to return an HP XT to service. The NCF will assist the site in restoring an HP XT. If this should occur, notify the OAT director as soon as practicable.

3.4 Maintenance Data Collection

The new AWIPS XT equipment has a three-year warranty and will be serviced by Dell, Inc.. The OAT does not have a sufficient length of time or track enough sites to provide a statistically valid maintenance analysis, but the problems noted and system outages will be reported as indicators of the stability of the AWIPS XTs. **All problems must be called to the NCF for tracking purposes and to ensure they are entered into the discrepancy report data base when appropriate.** The NCF will be asked to provide copies of the trouble tickets opened on the XTs during the OAT to the test team for evaluation.

EMRS will collect maintenance data on the new XT equipment. The NWS electronics staff must document all maintenance activity on the XTs in accordance with the instructions in the Engineering Handbook No. 4 (EHB-4). Contact John Merhi for all maintenance data reporting requirements for EMRS at 301-713-1892 x200.

4.0 OAT Materials

The following equipment and materials are required for the AWIPS XT Replacement OAT:

- a. AWIPS XT Replacement hardware and software and the FMK - The required equipment as described in Section 4.1 - Part I, System Description and Configuration.
- b. AWIPS System Modification Note 22 - Used to install and configure the XTs.
- c. AWIPS XT Replacement OAT Plan - Used to ensure the uniform conduct and completion of the OAT and as a source of contact points for coordination.
- d. AWIPS XT Replacement Installation Evaluation - Used to gather input from the site personnel about how difficult and time-consuming the XT installation was (see Attachment 2).

5.0 OAT Schedule

The OAT schedule includes 45 days of AWIPS XT installation and use. Table 4 lists the tentative dates of the major OAT milestones. The installation schedule may change depending on the problems encountered and the time needed to correct the Modification Note.

Table 4. OAT Activities and Schedule			
Preparation		Timeframe	Scheduled Date
1.	OAT orientation conference call	Week 1	August 11
2.	Practice installation and correct Mod. Note on NMTW systems at WSH.	1 week prior to start	August 3
3.	Ship equipment and FMK to OAT sites	Month prior to start	July 8-August 9
Installation and Evaluation		Weeks 1-5	
4.	First regional headquarter site installs AWIPS XTs and completes Installation Evaluation. WSH test team on site. SRH (EHU)	Week 1	August 10
5.	Conference call to discuss the installation. Modification Note revision.		August 11
6.	WFO BOX and RFC TAR site installation. Complete Installation Evaluation. WSH test team on site.	Week 2	August 17-20
7.	Conference call to discuss the installation. Modification Note revision. Decision on readiness to proceed with remainder of sites or test at additional operational site.		August 19
8.	Remaining sites install AWIPS XTs and complete Installation Evaluation.	Weeks 3-8	August 23-September 30
9.	Conference call to discuss the installations.	Week 3	August 26

10.	Post installation conference call; discuss installations and any problems encountered and what could be improved. Decision on deployment readiness.	Week 8	September 30
Operations		Weeks 3-8	
11.	Sites continue to operate with XTs. Sites document problems by email. Conference calls held if needed.	Week 3-8	August 23-September 30
12.	Decision on deployment readiness.	Week 8	September 30
Data Analysis and Reporting		Week 9	
13.	WSH OAT Team analyzes test data and sends report containing conclusions and recommendations.	Week 9	October 8

PART III: OAT Reporting

1.0 Introduction

This section describes the OAT data analysis and reporting.

2.0 Reports

If critical AWIPS XT problems occur, interim reports will be distributed immediately by e-mail to document the issues and the impacts on the field or on data distribution. The AWIPS XT Replacement OAT Report, and recommendations containing OAT details, will be coordinated and distributed within 60 days after the end of the OAT.

3.0 Data Analyses

OOS TEB will perform analysis of the test data collected during the OAT. The data will be analyzed to provide information about the XTs to support a decision whether to proceed with deployment of the XTs in all sites and to identify problems and equipment outage periods. The analysis will be incorporated into the final OAT Report.

The NWS Configuration Management will collect and analyze the EMRS data entered. These data will be reported separately from the OAT Report.

4.0 Briefings

Briefings to NWS management will be provided as requested.

Attachment 1 - AWIPS XT Replacement OAT Sites

Table A1-1. AWIPS XT Replacement OAT Sites							
	OAT Site Type	Region	Test Site		Programs	OB4-β	# WS
NOTE: The last column (# WS) indicates the number of AWIPS workstations assigned to each site under the AWIPS baseline. Each site will receive one XT replacement for each AWIPS baselined workstation. Workstations acquired from other sources (e.g., the Regions) will <u>not</u> receive an XT replacement under this project.							
1	RHQ	Central	CRH	BCQ	Regional headquarters; alpha testing of OB4 and XTs	Done	3
2	RHQ	Southern	SRH	EHU	Regional headquarters; Initial field test system	Jul 20	3
3	WFO	Eastern	Taunton, MA	BOX	Marine	Aug 11	5
4	WFO	Eastern	Buffalo, NY	BUF	Great Lakes	Sep 23	5
5	WFO	Central	Wichita, KS	ICT	Severe weather potential	Aug 4	5
6	WFO	Southern	Lubbock, TX	LUB	Severe weather potential	Aug 11	5
7	WFO	Southern	Nashville, TN	OHX	Severe weather potential	Sep 14	5
8	WFO	Western	Boise, ID	BOI	Fire weather	Sep 23	6
9	WFO	Western	Reno, NV	REV	Fire weather	Aug 10	5
10	RHQ OCONUS	Alaska	ARH	VRH	Regional headquarters, OCONUS	Jul 20	3
11	WFO OCONUS	Alaska	Juneau, AK	AJK	OCONUS		4
12	RFC	Central	Missouri Basin	KRF	RFC	Sep 23	10
13	RFC	Eastern	Northeast	TAR	RFC	Aug 11	7
Preliminary Testing:							
1	Test system	NGIT		TBDW		Done	2
2	Test system	WSH		NMTR		Jul 14	3

Attachment 2 - AWIPS XT Replacement Installation Evaluation

Test Site _____

Modification Note Used: # _____

1. What is your position title?

- ☐ ESA
- ☐ Electronic Technician
- ☐ Lead Meteorologist
- ☐ LINUX Focal Point
- ☐ SOO
- ☐ ITO
- ☐ Other _____

2. Rate the XT hardware installation process:

- ☐ 0 = no answer
- ☐ 1 = very difficult
- ☐ 2 = somewhat difficult
- ☐ 3 = average
- ☐ 4 = easy
- ☐ 5 = very easy

Comments:

3. How long did the complete XT replacement installation take?

4. Rate the XT replacement software installation, including localization, process:

- ☐ 0 = no answer
- ☐ 1 = very difficult
- ☐ 2 = somewhat difficult
- ☐ 3 = average
- ☐ 4 = easy
- ☐ 5 = very easy

Software installation process comments:

5. How long did the complete software installation take?

6. Were all the required XT replacement components provided in a timely manner?

- ☐ YES
- ☐ NO

Comments:

7. Rate the utility of the AWIPS System Modification Note:

- ☐ 0 = did not use
- ☐ 1 = not useful
- ☐ 2 = lacking needed information
- ☐ 3 = adequate
- ☐ 4 = useful
- ☐ 5 = very useful

Comments:

8. Rate the ease of use of the AWIPS System Modification Notes:

- ☐ 0 = no answer
- ☐ 1 = very difficult
- ☐ 2 = somewhat difficult
- ☐ 3 = average
- ☐ 4 = easy
- ☐ 5 = very easy

Comments:

9. Was assistance from outside the office required during the installation?

- ☐ NO
- ☐ YES, **please list the outside contacts you made** (e.g., office or person contacted from WSH, NCF, SST, IBM, Dell, other), **and describe the problem with which you needed help and the solution given.**

10. How can the installation process be improved for full deployment?

11. Other comments about the installation of the AWIPS XT Replacement.

Email answers to completed questionnaire to mary.buckingham@noaa.gov or fax to 301-713-0912

Attachment 3 - EMRS Guidance for the AWIPS XT Replacement

Contact John Merhi for all maintenance data reporting requirements for EMRS at 301-713-1892 x200.

Attachment 4 - Contact Lists

Table A4-1. AWIPS XT Replacement OAT Team					
Name	Responsibility	Org. Code	Email Address	Telephone	Fax
Mary Buckingham	OAT Director	OPS24	Mary.Buckingham@noaa.gov	(301) 713-0326 x137	(301) 713-0912
Ken Bashford	OAT Coordinator	OPS24	Kenneth.Bashford@noaa.gov	(301) 713-0326 x113	(301) 713-0912
Jerald Dinges	Test & Evaluation Branch Chief	OPS24	Jerald.Dinges@noaa.gov	(301) 713-0326 x160	(301) 713-0912
Tim Hopkins	Linux LX Project Manager	OST31	Tim.Hopkins@noaa.gov	(301) 713-1570 x129	N/A*
Jim Williams	Technical Expert	OST31	James.D.Williams@noaa.gov	(301) 713-1570	N/A
Joel Williams	Implementation	OST11	Joel.Williams@noaa.gov	301-713-3400 x114	N/A
Jagdish Sharma	Maintenance Branch AWIPS Computer Specialist	OPS12	Jagdish.Sharma@noaa.gov	301-713-1833 x128	(301) 713-0964
Karthik Srinivasan	Maintenance Branch AWIPS Engineering Support	OPS12	Karthik.Srinivasan@noaa.gov	301-713-1892 x158	N/A
John Merhi	EMRS	OPS13	John.Merhi@noaa.gov	(301) 713-1892 x200	N/A
Gary Charles	NCF Focal Point	AWIPS NCF	Gary.Charles@noaa.gov	301-713-9344	N/A
Brad Scalio	NCF Focal Point, backup	AWIPS NCF	Brad.Scalio@noaa.gov	301-713-9344	N/A
Wayne Martin	Site Support Team	OPS21	Wayne.Martin@noaa.gov	301-713-1724 x166	N/A
Joseph Gofus	OH Focal Point	OH	Joseph.Gofus@noaa.gov	301-713-0640 x156	N/A

* N/A = Not applicable

Send problems to the following (after calling the NCF):

email to: Mary.Buckingham@noaa.gov

or fax paper to: **301-713-0912**

AWIPS System Modification Note: <ftp://140.90.24.7/AWIPS>

AWIPS Information Note:

[http://www.ops1.nws.noaa.gov/awipsnew/software/InfoNote17RevA\(HP-disposal\)_S.pdf](http://www.ops1.nws.noaa.gov/awipsnew/software/InfoNote17RevA(HP-disposal)_S.pdf)

Table A4-2. OAT Site Contacts		
Region	Office	Contact Points
Central	Central Region Headquarters (BCQ) 7220 NW 101st Terrace Kansas City, Missouri 64153 Tel : 816-891-7734	FP: Bill Gery x414
	WFO Wichita (ICT) 2142 South Tyler Road Wichita, KS 67209 Tel: 316-942-3102	MIC: Richard Elder SOO: Pete Wolf ITO: Mike Urban ESA: Ken Thompson
	Missouri Basin RFC (KRF) 1803 N. 7 Hwy Pleasant Hill, MO 64080 Tel: 816-540-5151	HIC: Larry Black DOH: Bob Cox ESA: John Tatum -5147 x372 ET FP: Bruce Dunnihoo
Eastern	WFO Boston (BOX) 445 Myles Standish Blvd Taunton, MA 02780 Tel: 508-823-1900	MIC: Bob Thompson x222 SOO: David Vallee ITO: James Notchey ESA: Don Mackay -2444 x228
	WFO Buffalo (BUF) 587 Aero Drive Buffalo, NY 14225 Tel: 716-565-0204 x221	MIC: Darin Figurskey x222 SOO: Tom Niziol ITO: Fred Pierce ESA: Ed Holmes
	Northeast RFC (TAR) 445 Myles Standish Blvd Taunton, MA 02780 Tel: 508-824-5116	HIC: Gregg Rishel x232 DOH: Rob Shedd ESA: Don Mackay -2444 x228
Southern	Southern Region Headquarters (EHU) 819 Taylor Street, Room 10A06 Fort Worth, TX 76102 Tel: 817-978-7777	FP: Eric Howieson x132

Table A4-2. OAT Site Contacts		
Region	Office	Contact Points
	WFO Lubbock (LUB) 2579 South Loop 289, Suite 100 Lubbock, Texas 79423 Tel: 806-745-4260	MIC: Justin Weaver SOO: Steve Cobb ITO: John Holsenbeck ESA: Carl Hill
	WFO Nashville (OHX) 500 Weather Station Road Old Hickory, TN 37138 Tel: 615-754-4633	MIC: Larry Vannozzi SOO: Henry Steigerwaldt ITO: Michael Davis ESA: Steve Clark
Western	WFO Boise (BOI) NIFC Building 3807 3833 S Development Ave Boise, ID 83705 Tel: 208-334-9860	MIC: John Jannuzzi -1660 SOO: Timothy Barker ITO: R. Jason Baker ESA: Michael.Pereira
	WFO Reno (REV) 2350 Raggio Pkwy Reno, NV. 89512 Tel: 775-673-8100	MIC: Jane.Hollingsworth SOO: Jim.Fischer ITO: David.Pike ESA: Norman.Johnson (Duffy) -8102
Alaska	Alaska Region Headquarters (VRH) 222 West 7th Ave #23 Anchorage, AK 99513-7575 Tel : 907-271-4421	FP: Philip Mieczynski
	WFO Juneau (AJK) 8500 Mendenhall Loop Road Juneau, AK 99801 Tel: 907-790-6800	MIC: Tom Ainsworth SOO: Carl Dierking ITO: Angel Corona ESA: Kim Custer

